UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

SEPTEMBER 1951

EROSION CONTROL PRACTICES DIVISION

Froid Field Trial - T. S. Aasheim, Havre, Montana.-"Plots in this project were cultivated for the fourth time during the month. This cultivation was necessary in order to control volunteer wheat which started growing after the wet period in late August and early September.

"Yields of grain from the various plots in this project were calculated during the month and are given in the following table.

"Yield of spring wheat produced in 1951, on various methods of fallow at the tillage demonstration farm near Froid, Mont.

Fallow Method	Bushels Per Acre
Spray	19.9
Spray (Fall chisel)	19.5
Subsurface	19.8
Subsurface (Fall chisel)	18.9
Subsurface (Cultivated after harvest)	18.8
Subsurface (One way seeder)	--
Oneway	18.0
Plow (Mold board)	18.9

"It is interesting to note how favorably the chemical fallow compares with the more conventional fallow methods. Chemical fallow was sprayed twice and subtilled once during 1950. Cultivated fallow was worked four times."

Runoff Erosion Plots and Clean-Cultivated Plots - R. M. Smith, Temple, Texas.-"Mr. Tippit reports that after almost 3 months of extreme drought, the total rainfall of 6.3 inches for the month was 2.8 inches above normal. Local runoff was not considered heavy, but stream flow has greatly increased and water has been caught in many farm ponds. A large number of cotton and corn fields of the area suffered considerable erosion, even though the dry, cracked ground took in and held much of the water which fell.

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*All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"Experimental runoff erosion plots with good surface cover or mulch showed no runoff or erosion whereas clean cultivated plots lost as much as 25 percent of the total rainfall. The lack of large, water-stable surface soil aggregates appeared to be an outstanding soil factor involved in the observed erosion losses, both on control plots and on fields. Air slaking and raindrop impact quickly reduced all of the dry surface soil clods on bare ground to silt-sized or finer particles. These were easily eroded away by runoff water, even on slopes of only 2 to 4 percent. Organic trash left by subsurface plowing appeared to be very effective in preventing runoff and erosion wherever the Graham-Hoeme plow had been used to prepare land for fall seeding."

Legume Studies - N. P. Swanson, Amarillo, Texas.-"Hubam clover was planted in the spring of 1951 at two different dates. One planting was made before the spring rains and the other after the heavy May rains. A crop of weeds was killed before the late planting was made but no weeds had emerged at the time the first planting was made. Crop yields from the last planting were much higher with 1,000 pounds of air dry forage and 300 pounds of mature seed per acre. The early planting produced a total of 100 pounds of tops and seed per acre, which would be classed as a crop failure. Weed competition in the early planted plots accounted for this crop failure.

"Madrid clover seeded in the fall of 1950 and harvested the first of June 1951 made a yield of 2,800 pounds of air dry forage per acre. Good stands were secured in the fall but the plants furnished no winter cover. The crowns stayed alive during the winter and started top growth in the spring.

"In the spring of 1951, Madrid clover was seeded in pure stands, with grama grass and with crested wheatgrass for a test to see if Madrid clover could be used with grass and in pure stands for grazing. Good stands resulted on all plots with considerable weed competition. The plants withstood the weed competition fairly well, and at this time a good stand remains on the plots. Steers have been allowed to graze these plots for the past 2 weeks and have grazed mostly on the Madrid clover. The steers also have access to western wheatgrass, sideoats, blue grama, crested wheat and buffalograss in the same field."

Soil Permeability - G. M. Horner, Pullman, Washington.-"A comparison has been made between the rates of water percolation through soils as measured by laboratory analysis and as estimated in the field by the Conservation Surveyors. Fifteen soils, representing 20 horizons, located in the Yakima Valley and in the Seattle Work Group Area were selected for this study. In general, the field estimation of the permeability of the soil agreed within one permeability class of that obtained in the laboratory. The discrepancy was two permeability classes or greater in eight of the 20 cases.

"There were definite trends in the direction of the differences between the field and laboratory values of permeability. These trends are as follows:

1. Soils that have slow or very slow permeability rates were all classified in the field with too high a rate.

2. Soils that have moderately rapid to very rapid permeability rates were classified in the field in the correct class or at too low a rate.

3. Soils that have moderate or moderately slow rates fell intermediately between the above trends. There was about the same tendency to classify the permeability too low as it was to classify it too high."

Infiltration Capacities of the Experimental Areas on the Wheatland Station - W. A. Daniel, Guthrie, Oklahoma.-"M. E. Cox working with Louis E. Derr and Elmo Baumann of SCS Operations have been studying the infiltration capacities of the experimental areas on the Wheatland Station. The rate of infiltration on one plot was increased from 0.07 inch per hour to 6.60 inches per hour by removing 10 inches of topsoil. This indicates that the soil below the plow-pan is freely permeable but is locked off by the presence of the plow-pan and a surface soil in poor physical condition."

Kudzu Experiments - J. Vincente-Chandler, Rio Pedras, Puerto Rico.-"The 'Research Notes' which we release periodically to SCS Operations are being translated to Spanish and published in the Sunday edition of 'El Mundo.' They have aroused great interest among the farmers in Puerto Rico.

"Following our advice the 12-acre field of insect infected Kudzu near Vega Alta was grazed by cattle. The Kudzu is now growing vigorously and shows almost no signs of insect damage. However, what appear to be deficiency symptoms are evident on many of the leaves. We have treated areas in this field with potash and phosphate fertilizers in an attempt to clarify the situation. It seems probable that the insect (Cerotoma ruficornis) causes major damage to Kudzu only when the latter is weakened by nutritional deficiency or other causes."

Potato Irrigation Experiment (Arnot) - G. R. Free, Ithaca, New York.- "Potatoes were planted May 16, sprayed for defoliation August 28, and harvested from September 19 through 26. Irrigated plots received slightly over 8 inches of water between planting and defoliation, the greater portion being applied during a dry spell the latter part of August. Spraying for insect control started June 4 when potato tops began to appear and weekly thereafter until defoliation.

"Total yields per acre were high. Potatoes following 1 year of sod show increases over 2 years in potatoes of 8.2 percent for irrigation and 6.2 percent for rain only where no mulch was applied. Where 3 tons of straw mulch was used, increases jumped to 11.6 percent and 11.4 percent respectively. Weather conditions were quite favorable this year and irrigation during the dry spell in August did not increase yield on the continuous potatoes and caused only a slight increase on the rotation plots."

Table 1.--Total potato yields - bushels/acre

	Irrigation - no mulch	Irrigation + mulch	Rain - No mulch	Rain + mulch
2d year potatoes	533.9	539.9	552.4	539.1
Potatoes following 1 year sod	598.8	627.2	587.1	602.4
% increase	8.2	11.6	6.2	11.4

Conservation Practices - T. W. Edminster, Blacksburg, Virginia.-"Due to the low rainfall during the early part of the growing season, there was considerable tie-up of nitrogen on all of the stubble mulch plots. Two small rains in September aided the release of the nitrogen with the resultant step-up in growth in the corn. This has delayed ripening of the corn to a considerable extent with the result that no corn harvest will be completed until well into October. It is probable that even at that date, it will be necessary to rely upon a corn dryer to prevent spoilage of soft corn."

Potato Rotation and Irrigation Plots - O. R. Neal, New Brunswick, New Jersey.-"Yields from the potato rotation and irrigation plots are shown below:

Cropping system	Potato yield - bu./a.	
	Irrigated	Not irrigated
Continuous potatoes	276	265
Potatoes and wheat	324	324
Potatoes, wheat, and clover	324	383

"In order to evaluate the effects of the different cropping systems on plant growth and yield, the above yields are shown on the basis of total production of No. 1 size tubers.

"On unirrigated areas yields increased from 265 Bu./a. on continuously cultivated areas up to 383 bu./a. in a 3-year rotation of potatoes, wheat, and clover. In past years the 2-year rotation has produced yields equal to or above those from the 3-year system but this was not true during the current season.

"Areas under each of the cropping systems are irrigated when soil-moisture tension, at an 8-inch depth, reaches a value between 1 and 2 atmospheres. On this basis irrigation was required only two times during the 1951 season. Irrigation did not increase the yield significantly on the continuously cultivated and 2-year rotation areas, and actually reduced the yield from the 3-year rotation plots. This same result was obtained from irrigation of sweet corn during the 1951 season. Measurements of physical properties of the soil have indicated that the irrigated areas as compared with unirrigated are more compact, have a smaller amount of air-filled pore space, and drain more slowly. It appears that the combined effects of these poorer physical soil conditions in reducing yields have more than out-weighed any benefits to be expected from the additional water."

Beef Production from Pastures and Supplemental Irrigation - D. D. Smith, Columbia, Missouri.-"Beef production from pastures ranged from 163 to 390 pounds an acre up to Mid-September. Highest producer was Ladino Clover-Bromegrass. Kentucky Bluegrass-Korean Lespedeza-Ladino Clover produced 323 pounds, and Bromegrass which receives nitrogen fertilizer spring and fall made 303 pounds. Kentucky Bluegrass without soil treatment was low in beef gain, with 163 pounds. Kentucky Bluegrass with ample minerals and nitrogen spring and fall produced 238 pounds of beef an acre. Two new pastures, Orchard Grass-Kobe Lespedeza and Alta Fescue-Kobe Lespedeza, were grazed lightly this season.

"Well-distributed rainfall throughout the summer made supplemental irrigation unnecessary on the irrigation study this year. A 2-inch irrigation on wheat during the

October drought last fall increased the yield 14 percent. Fertilized wheat made 22.8 bushels per acre, compared with 26.0 bushels where fertilizer and irrigation were applied."

Wind Erosion Studies - A. W. Zingg, Manhattan, Kansas.-"Dune sand secured near Lamar, Colo., was subjected to tests in the wind tunnel during the month. It was found that surface ripples found in drifting sand are closely associated with the sorting process. As the finer material is removed by wind the dimension of the ripples increases. A preliminary write-up of the experiment was made."

Conservation Practices - B. H. Hendrickson, Watkinsville, Georgia.-"One storm, occurring September 22, caused erosion in September. This storm of 1.54 inches was excessive, having rates in excess of 5.00 in./hr. for 5 minutes and 2.00 in./hr. for 30 minutes. Erosion was moderate, ranging from 1-1/2 tons on Class III continuous cotton to none on the better conservation type rotation. Runoff ranged from 20 percent on continuous cotton to none from the kudzu-corn rotation."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Rainfall of 3.09 inches for the month helped replenish moisture supplies in the surface soil. It came too late to affect the corn yield. The storm of September 13, of 1.85 inches caused runoff on the contour-corn watershed as well as on the straight-row watershed. There was no surface flow from any area other than corn.

"As the moisture content of the soil prior to the September 13, storm was extremely low, there was ample pore space available to store within the 7-inch topsoil depth more than the entire amount of the 1.85 inches of rainfall. The soil surface in the cornfield--sealed by previous rains--was able to absorb the rainfall at the beginning of the storm at rates of less than 0.5 inch per hour. At such low moisture content and no soil sealing, the infiltration capacity would ordinarily be over 5 inches per hour. As only a thin-sealed layer of surface soil controlled the infiltration rate, there was practically no reduction in rate throughout the duration of the storm. At 5:10 p. m., the beginning of the storm, infiltration capacity was 0.5 inch per hour and remained unchanged at 9:30 p. m.--the end of the storm.

"On the mulch watershed where there was less surface sealing, the soil absorbed all of the storm rainfall--even though rainfall intensities reached 2 inches per hour. Runoff data from the corn watersheds for the September 13, storm are given in the following table:

Table 1.--Rainfall and runoff from corn watersheds, September 13, 1951

Watershed No.	Culture	Rain	Runoff	
			Total	Maximum rate
		Inches	Inches	In./hr.
118	Plow-str. row	1.85	0.35	0.38
113	Plow contour	1.86	.11	.16
111	Mulch-contour	1.85	0	0

"Yield on conservation corn watershed No. 113 this year was less than that on the straight-row prevailing-practice watershed. It has been less for all corn years during the 9 years of comparison. The percentage difference is getting less, however, as indicated by the data in table 2.

Table 2.--Corn-yields on prevailing, conservation, and mulch corn watersheds, 1951

Watershed No.	Culture	Year	Yield per acre	
			Bushels	Difference (% of No. 118)
118	Prevailing	1943	51.4	-
		1947	48.0	-
		1951	78.1	-
113	Conservation	1943	20.0	39
		1947	41.5	86
		1951	68.6	88
111	Mulch	1943	40.0	78
		1947	56.8	118
		1951	86.5	111

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"Rains of September 10 and 13 broke the prolonged hot dry period that had started after the rain of June 16. Rain September 10 totaled 1.45 inches and September 12-13 totaled 3.66 inches. Total rainfall for the month amounted to 5.92 inches compared to the normal of 2.94 inches. Following these rains there was considerably cooler weather. These rains with 2.41 inches in 1 hour on September 13 at Project Headquarters caused only a trace of runoff from the areas on the Government-owned land, most of which is deep Houston Black Clay. For areas C and D where a considerable portion of the area has shallower soils of the Wilson and Crockett series the runoff rates were 0.183 and 0.513 inch per hour respectively. Very little water was added to the water-supply lake and the water-supply situation both at the project and adjacent stock farms is still critical.

"J. B. Pope reports that rains during the month supplied sufficient moisture for seedbed preparation for the seeding of oats and clover on corn and cotton land.

"The percentages of moisture at the designated depths on cropland areas from samples taken September 17 were as follows:

"0-6 inches, 23.8 percent; 6-12 inches, 23.6 percent; 12-24 inches, 22.1 percent; and 24-36 inches, 21.5 percent.

"Meadows and pasture areas from which no runoff occurred during the month have greened-up. Soil samples taken on September 26 down to a depth of 36 inches gave the following percentages of moisture at the designated depths:

"Native Meadow: 0-6 inches, 24.7 percent; 6-12 inches, 24.0 percent; 12-24 inches, 19.1 percent; and 24-36 inches, 15.2 percent.

"Bermuda Grass Pasture: 0-6 inches, 23.3 percent; 6-12 inches, 24.3 percent; 12-24 inches, 21.3 percent; and 24-36 inches, 17.9 percent.

"In connection with the crop yields J. B. Pope reports that corn yields on the conservation farmed area show a considerable increase per acre over the conventional farmed area. The average yield per acre on the conservation farmed fields was 32.3 bushels per acre in comparison to 23.3 bushels from the conventional farmed fields. The yields were low on both areas, though when figured on a percentage basis the difference represents a 38.6 percent increase in favor of the conservation farmed area."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"With the exception of a 0.62 inch rain on September 3, and 1.11 inch rain on September 4, no single rain exceeded a half inch during the month although we had rain on 13 days totaling 3.34 inches. This is the eighth consecutive month the precipitation has been above normal with a total of 33.59 inches to September 30, this year.

"There was some runoff from most of the watersheds over Labor Day. An inspection of the charts indicate that conservation practices continue to reduce peak rates of runoff and total runoff.

"Since 3.25 inches of rain fell in the first half of September, land preparation for wheat was delayed. Wheat planting on the project area was completed on September 27, which is about a week later than usual. Corn yields this year in south central Nebraska will be higher than the long-time average. There are a

number of fields which have been in continuous corn where the yields will probably be less than 5 bushels per acre, however, this is offset by the better yields on ground that has been rotated and where better farming practices have been followed. After the corn samples are taken we should have some interesting comparison on yields for the watersheds under different land-use practices."

Hydrologic Studies - L. Stolzy, East Lansing, Michigan.-"On September 26 Dr. Stevens, Mr. Dils, and Mr. Smith of the Forestry Department held a meeting with the Acting Project Supervisor to discuss the possibility of cutting the merchantable timber on the wooded watershed at Rose Lake. This subject was first brought up at the Station Committee Meeting held on March 1 and was discussed in the monthly report. The Forestry Department mapped the vegetation stand on the wooded watershed during the summer months.

"The discussion was mainly whether permission could be obtained to remove the timber from this area. Dr. Turk was asked later to contact the men in charge of the Rose Lake Wildlife Experiment Station to see if it would be possible to carry out these plans. On September 28 the Acting Project Supervisor arranged a meeting at the wooded watershed with Dr. Turk, Dr. Stevens, Mr. Dils, Mr. Smith, and Dr. Black, in charge of the Rose Lake Wildlife Experiment Station, to discuss the possibility of cutting the wooded watershed. It was felt by Dr. Black that all personnel concerned with the wooded watershed could profit by this venture. A full report will be made by the Forestry people on the plans. This will be submitted to Mr. H. D. Ruhl, in charge of the Game Division of the Michigan Conservation Service for his approval.

"On September 24 this office worked up some data on maximum and minimum temperatures between forested and open conditions to be submitted to Mr. C. A. Engberg, State Soil Scientist. These data will be used to determine whether or not stream temperatures would be lowered by tree plantings on banks."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The September rainfall of 7.68 inches represents 240 percent of the 70-year average of 3.20 inches for Auburn.

"Four rains caused runoff and soil loss from the erosion plots in September. A summary of the water and soil losses will be given in the October monthly report.

"Serious erosion was observed on a number of newly seeded fields in the vicinity of Auburn. Two outlets on the Agricultural Engineering Farm that had been constructed, prepared, and seeded the first part of September were completely washed out on September 24. The outlets had 8-foot bottom widths and 6 to 1 side slopes. The rainfall was 1.93 inches on September 13 and 14 and 1.78 inches on September 22. The outlets took the water from these rains without any damage. Then on September 24 there was a rain of 2.6 inches with 2.3 inches falling in 30 minutes. This rain washed out an 8-foot strip 3 inches deep. The land adjacent to the outlets was freshly prepared and seeded, but had not been terraced.

"On September 5 and 6, Messrs. Kummer, Conniff, and Cooper attended the Irrigation Working Conference of the Southeastern Section of the American Society of Agricultural Engineers held in Auburn. Everyone who commented thought the meeting was very successful. The attendance was a few over 200 persons from 13 States. The water situation in the Southeast, research results in the Southeast, the power situation of irrigation, and farm results of irrigation were discussed. Eleven irrigation equipment companies were represented and demonstrated equipment.

Plans have been made to publish the proceedings of the conference when all of the abstracts or papers are in.

"On September 13 and 14, Messrs. Kummer, Medlock, Richardson, Sanders, Cooper, Tucker, Kearley, Richbourg, Alldredge, and Davis studied water disposal outlets in the Northwest and Northeast Soil Conservation Districts of Alabama. In the Northwest District a number of established and newly seeded W-meadows and relatively narrow V-type meadows were observed. In the Northeast District very wide meadows were observed. Some of these meadows were as wide as 300 feet. The vegetations observed were fescue, sericea, and a combination of the two. It was concluded that W-meadows could be used in shallow draws where the farmer was not willing to sow down the whole draw and the spoil from construction could not be blended into the side slopes without leaving a ridge on either side of the meadow that would block row water. Also, it was concluded that the slope of the channel was not a factor in deciding whether or not a W-meadow was to be used.

"The vegetation in the meadows observed was being utilized for hay, seed production and summer and winter grazing."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"At the request of Mr. Devereux, H. N. Holtan worked with Mr. A. G. Smith, V. P. I. Horticulturist, in the construction of a pond on the V. P. I. Horticultural Farm. The material in this pond is practically all silt; consequently, it was recommended that some gritty material, preferably sharp sand, be mixed with the silt to a depth of 6 to 8 inches and that this layer then be compacted with a sheepsfoot roller when it is at an optimum moisture condition. Conformation of the pond is completed but as yet incorporations mentioned above have not been made."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Mr. Blaisdell spent the last 3 weeks of the month at Stillwater, Okla., assisting Mr. Ree with tests on a 24-inch pipe spillway of the type used on the Washita River Flood Control Project. A great deal of practical information regarding pipe leakage, vortex formation, friction coefficients for concrete and corrugated pipe, and scour at the pipe outlet was obtained. This information should be of considerable value and interest to both flood control and districts operations. While the writer will be glad to attempt to answer specific questions regarding the experiments, it is preferred that the questions be directed to Mr. Ree.

"Mr. Blaisdell's letter to ENGINEERING NEWS-RECORD concerning box inlet drop spillways was published in the 'Reader Comment' column of the September 20, 1951, issue of that magazine on page 45."

SCS-TP-106, "Hydraulic Design of the Box Inlet Drop Spillway," by F. W. Blaisdell and C. A. Donnelly has just been released and copies can be obtained.

Hydraulic Studies - W. G. Ree, Stillwater, Oklahoma.-"Construction of the experimental pipe outlet was completed. The outlet includes a straight intake structure, 108 feet of 24-inch concrete pipe, a 24-inch 84° corrugated pipe elbow, and 260 feet of 24-inch corrugated pipe. The total fall in the line is 11 feet. The maximum head possible on the intake is 14 feet. In addition to the outlet there are the necessary appurtenances to control the flow and to make the measurements of flow rates and pressures.

"Six experiments were run on this outlet. Each experiment had a different type of entrance. These were:

Experiment 1 - Straight headwall with standard pipe groove entrance.
Experiment 2 - Straight headwall with curved entrance of 3-inch radius.
Experiment 3 - Same as experiment 2 except for the addition of a debris guard.
Experiment 4 - Straight headwall with square edged entrance.
Experiment 5 - Drop inlet on entrance 2-1/2 feet square and 4 ffeet high.
Experiment 6 - Drop inlet on entrance 2-1/2 feet square and 8 feet high.

"Ten to 17 test flows were run on each experiment. The data are being analyzed and preliminary results will be available soon. Mr. F. W. Blaisdell spent 3 weeks at Stillwater assisting in running the experiments."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Georgia.-"We were so busy in the midst of a severe drought at the end of August there was not time to prepare a report. Therefore this report is for August and September.

"W. B. Land reports the following hydrologic measurements: Rainfall during these 2 months was, August 8, 9, and 10, 0.60; August 22, 0.08; September 6, 0.14; September 13 - 15, 0.95; September 22, 1.45; September 24 - 26, 0.60. The total rainfall for this period was 3.82 inches. Evaporation from the pan was 7.98 and 5.49 inches in August and September, respectively. Wind movement was 396 and 331.2 miles for the 2 months. Soil moisture was high at the beginning of August from rains the last days of July. The supply became depleted, however, by the middle of the month and was critically low by the middle of September when showers began falling.

"The severe drought in August and September was very wide spread over the Southeast. Many streams became critically low. Reports were received of wells going dry in many rural sections. There were several editorials noted in newspapers relative to low municipal water supplies. A report came to our attention of one small town in Georgia buying several thousand feet of portable irrigation pipe to transport water from another stream because the regular source was dry.

"W. B. Land completed the harvest records on the tomatoes and pole beans in the irrigation study. This study included irrigation when only 35 percent of the available soil moisture was used up to maintain a high soil-moisture level, irrigation when 65 percent of the available soil moisture was used up (low level) and no irrigation check. There was adequate rainfall throughout June and early July.

"The rainfall and irrigation records for the vegetables and some sweet corn studies are given in table 1.

"The high moisture level plots received 5.50 inches of water in six applications and the low level series received 4.50 inches in four applications.

"The yields of pole beans and tomatoes are given in tables 2 and 3, respectively. The more frequent applications and extra 1 inch of water in the high moisture level gave enough increase in yield of the pole beans to make this practice worthwhile. With the tomatoes, however, the low level plot yields were nearly as high as that from the high level irrigation. Irrigation had no affect on the proportion of damaged tomatoes in respect to the total yield from each treatment.

"W. B. Land reports that four plantings of sweet corn were made on April 19, May 29, and June 22, respectively, to check the relation of the date of planting to the response from irrigation. The first planting was irrigated 1.0 inch on

June 6. This was followed by a rain June 7 and no response was obtained from the irrigation. The yields of roasting ears in dozens of ears per acre and tons per acre from the four plantings were:

Planting Date	Harvest Date	No. ears per acre		Weight per acre	
		Irr.	Check	Irr.	Check
		Dozens		Tons	
4/19	7/9-13	785	820	3.125	3.135
5/8	7/20-25	801	843	3.135	3.385
5/29	8/3-16	883	818	2.980	2.715
6/22	8/24-30	948	747	3.170	2.490

"The differences in yield of the first three plantings were minor. Only the fourth planting had a severe deficiency of soil moisture at the time the ears were forming. The one irrigation increas d the number of usable ears and the weight by 27 percent.

Table 1.--Dates and amounts of rainfall and irrigations on vegetables and sweet corn June 16 to August 15, 1951, during the fruiting period.

Date	Rainfall	Irrigations					
		Vegetables		Sweet corn plantings			
		High level	Low level	1st	2nd	3rd	4th
6/16-17	1.27						
6/20	.09						
6/25	.22						
6/27		1.50	1.50				
6/28	1.09						
6/30-7/4	3.05						
7/10		.75					
7/12			1.00				
7/13	.30						
7/15	.10						
7/17		.75					
7/19	.20				1.00	1.00	
7/20			1.00				
7/22	.25						
7/24		.50					
7/25-26	1.90						
7/28	.01						
7/30	2.67						
8/6		1.00					
8/8			1.00				
8/9-10	.60						1.00
8/14		1.00					
8/15							1.00
Total	11.75	5.50	4.50	0	1.00	1.00	2.00

Table 2.--Yield of pole beans in 1951 with three levels of soil moisture

Treatment	Yield	Increase over check	
	lb/ac	lb/ac	Percent
Irrigated, high level of soil moisture	10,000	4,750	90.5
Irrigated, low level of " "	8,500	3,250	61.9
Unirrigated, Check	5,250	0	0

Table 3.--Yield of tomatoes in 1951 with three levels of soil moisture

Treatment	Total yield lb/ac	Increase with irrigation lb/ac	Increase with irrigation Percent	Good tomatoes lb/ac	Unusable tomatoes lb/ac	Portion of total yield usable Percent
Irrigated, high level of soil moisture	18,350	6,330	52.2	16,180	2,170	88.1
Irrigated, low level of soil moisture	17,500	5,480	45.2	15,200	2,300	86.9
Unirrigated, Check	12,020	0	0	10,500	1,520	87.4

"John R. Carreker accompanied Director G. H. King, C. E. Rice and Kenneth Treanor of the Georgia Agricultural Experiment Stations and C. W. Chapman, Assistant State Conservationist of SCS, to the three new State Branch Experiment Stations during August and September. We selected the sites for plot studies and then planned a program of land use for the remaining land on these Stations. The Northwest Georgia Station has a large creek along one entire side of the farm and offers unlimited possibilities for irrigation studies. Pond sites were selected on the Southwest and Southeast Georgia Stations. These ponds might provide limited supplies of water for a little irrigation work."

Supplemental Irrigation Studies - T. W. Edminister, Blacksburg, Virginia.- "Mr. Jones attended the Irrigation Working Conference that was sponsored by the Southeast Section of the ASAE at Auburn, Ala., on September 5 and 6.

"The entire project staff together with Messrs. Devereux, State Soil Scientist, Glenn Wilson and John Clay, Survey Supervisors, C. M. Jones, Drainage Engineer, Dr. S. S. Obenshain, VPI Agronomist, Dr. R. E. Blazer, VPI Agronomist, Dr. W. P. Judkins, Horticulturist, V. R. Hillman, State Soil Conservation Committee, and Mr. C. E. Seitz, Head, Agricultural Engineering Department, met with Messrs. R. C. Jones and George M. Renfro of the Regional Office to assist in the discussion and preparation of the irrigation guides to cover the Piedmont and Ridges and Valleys Regions of the State of Virginia. These guides were prepared on the basis of material developed from permeability surveys and from the other programs dealing with soil and water relationships. The preliminary draft was completed contingent upon final development of notes on the effect of crop root depth. A conference was to be held with Dr. N. S. Hall of North Carolina in order that final information that he has developed on root growth through use of radio-active fertilizer could be had.

"The Project Supervisor together with various staff members prepared a preliminary draft on the problems of supplemental irrigation in the humid areas. This report, after having been checked by the Regional Office, will be submitted to the Washington Office in answer to the requests of Dr. Nichols and Mr. T. B. Chambers.

"Mr. Jones reports that the total rainfall for the month at the irrigation plots was approximately 2.75 inches. The last 8 settings of the 5th application of 1.5 inches of water was completed and 16 settings of the 6th application were also completed. The 7th application of 1.5 inches is being applied to determine the effects of irrigation on fall grazing.

"The steers will be sold around October 8 and the lots will be restocked for all grazing as in 1950.

"The areas seeded to ladino in each lot look fairly well and have made satisfactory growth to date.

"On the irrigation control plots the fourth cutting of alfalfa was made on September 2[illegible], with herbage yields almost double on the irrigated plots.

"The irrigated wheat plots produced less grain than the nonirrigated plots. Observations did not reveal this reversal at harvest time."

Drainage Studies -J. C. Stephens, West Palm Beach, Florida.-"Final application of test herbicides for the control of para grass on canal and ditch banks was made on the experimental plots along Cypress Creek Canal during the first week in September. Preliminary observations made on September 6, approximately 6 weeks after the first treatments began, indicate that CMU Weed Killer, or Para-Chlorophenyl-1, 1-dimethylurea, is the most potent of the herbicides applied. This material is still undergoing tests and has not yet been released for sale by the Du-Pont Chemical Corporation who owns the patent.

"The use of Xylol as a spreader plus Triton as an emulsifier, mixed with the standard concentration (125 lbs. per acre) of Sodium TCA, appears to have some advantages over the other standard TCA mixes. The use of commercial detergents (Dreft, etc.) as spreaders apparently did not do quite so well as the Xylol-Triton mix in killing effect. However, the detergents are less expensive and in sprays that need a wetting agent to combat the waxy coating on certain vegetation, its use appears promising.

"The application of several small concentrations of Sodium TCA (25 lbs. per acre) applied at intervals approximately 3 weeks apart as a method of reducing material cost is showing up well. The use of contact chemicals, such as Shell Weed Killer 130, in combination with Sodium TCA, has been disappointing so far. The Calcium TCA proved less potent than Sodium TCA and the liquid Isopropyl TCA was practically useless. Polybor-Chlorate-88 seems to require such a heavy concentration for kills that its use is probably too costly to compete with Sodium TCA for farm purposes.

"A seeding of Pensacola bahia grass was made on a 10-foot strip across each of the herbicide test plots on September 19. Two more similar seedings are planned to be made at monthly intervals to determine the residual toxicity left on each test plot, and also to determine the feasibility of establishing a more desirable sod which will prevent regrowth of the para grass on the ditch banks. It will be from 6 weeks to 3 months before final evaluation of all the test results can be made.

"Specimens of Najas guadelupensis were collected from ditch bottoms and transplanted into battery jars and stored in the greenhouse at the Everglades Experiment Station. When the plants become well established in the soil placed in the bottom of the jars, various herbicides will be introduced and the results compared with the kill produced by WS 1492 (an aromatic petroleum oil) which will be used as the standard control. Any formulations which show promise will then be given additional tests under field conditions.

"Pensacola bahia grass was seeded on selected areas on six flood control levees to determine the practicability of this method of establishing grass for erosion control. Each of the areas contains approximately 1/6 of an acre and is located so as to be representative of different soil and rock conditions which occur along

the alinement of the various Federal levees. A special fertilizer mixture recommended by the Everglades Experiment Station was formulated for these trials. The fertilizer formula, 8-6-12-1-1-0.25-0.12, shows the composition of the mix, the first three figures being nitrogen, phosphoric acid, and potash while the last four refer to copper, manganese, zinc and boron in that order. The fertilizer was broadcast over the sites at a rate of approximately 1,500 lbs. per acre and after several days, the bahia seed were broadcast over the plots at the rate of approximately 15 lbs. per acre. These plantings will be observed at periodic intervals to determine growth conditions."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"With showers occurring on 14 days, moisture readings on the mulch plots remained low with the exception of the first part of the month, September 1-8 when only one shower was recorded.

"Samples collected from this area analyzed for nitrates as follows: Natural Cover, 1.1 ppm,Shavings, 1.1 ppm, Check Plot, 1.0 ppm, Pine Straw, 9.8 ppm, and Grass, 50.0 ppm. Of all the materials used, grasses have given the best all around results. It has been noted during the past few months that the shavings are beginning to deteriorate, and break down. Undoubtedly under normal grove cultural practices, there would have been a faster deterioration than we have found in these plots.

"Rainfall in the area use for truck cropping has been very light and spotty during the past summer. Usually there occurs at least one rain of 4 to 6 inches. During this summer the rains have been very light and as a result the chlorides have not leached out of the soil. Samples collected on September 26, 1951, showed that the concentration is somewhat higher than it was in this area a year ago. Unless heavy rains occur before the cropping season begins there is no doubt that more land than last year will not be used."

Drainage Studies - C. B. Gay, Fleming, Georgia.-"The summer crops including most of the pasture grasses and legumes and vegetables have grown unusually well on these heavy, newly cleared soils. The plots of Coastal Bermuda Grass have continued to make rapid growth. The Pensacola Bahia planting has grown much more this month than was expected. It has turned out to be a plot of very good grass. The neighboring farmers are all very busy establishing permanent pastures of their own since seeing the success with grasses on the Station lands."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-""The notes on the drainage formulae developed in Virginia were taken to Dr. Leonard McFadden of the V. P. I. Mathematics Department for review of soundness of mathematics. He devoted almost 2 weeks to the study of porous media and the mathematics involved in the flow of fluid through it. He concluded that, from the standpoint of mathematics, that all of the assumptions that were made in setting up the theory were too general to make a sound solution to the problem. Apparently his views agree with those set forth by Dr. Morris Muskat and Dr. Don Kirkham, who say that the flow of fluid into drains must follow both Darcy's law and Laplace equation. This involves the use of the 'relaxation method' of higher mathematics."

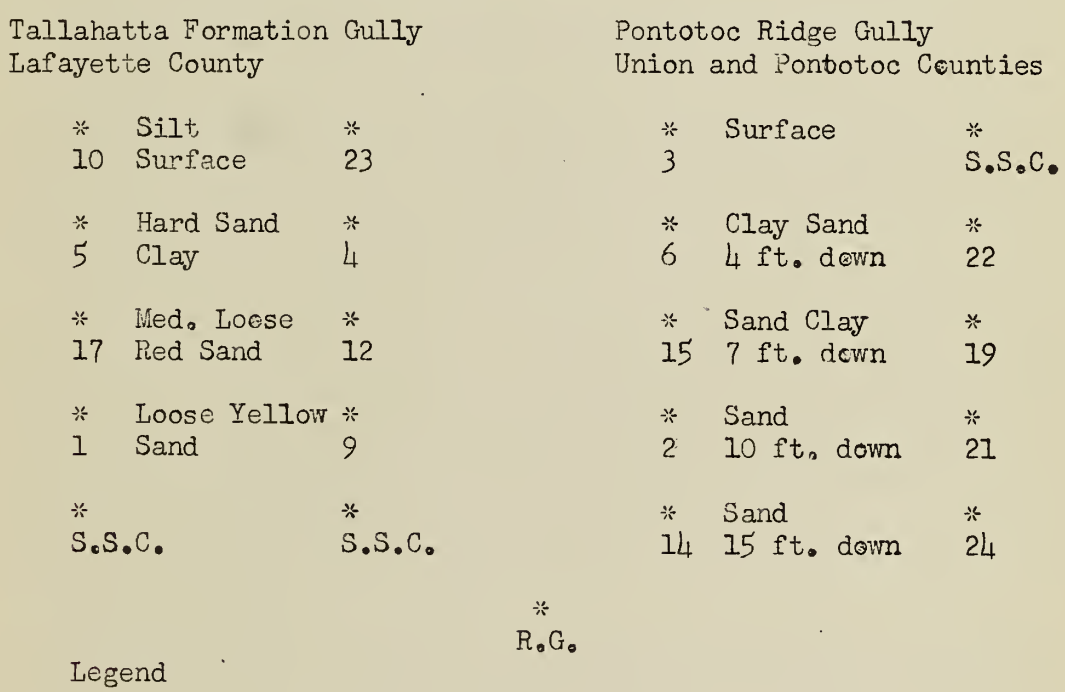
Sedimentation Studies - R. Woodburn, State College, Mississippi.-"The splash experiment equipment for comparing erodibility of soils from gullies in different geologic formation was completed and the experiment was set up.

"We were anxious to compare the detachability characteristics of materials from gullies in the Tallahatta formation with gullies in the Pontotoc Ridge. Studies in four gullies near Oxford, Miss., for period June 1949 - June 1951 disclosed that sediment was produced at a rate of 2 to 2.5 inches per year.

"Similar information was desired for Pontotoc Ridge gullies but no debris basins in that formation has been surveyed for such studies. We, therefore, planned to compare the two soil formations on the basis of splash rates, assuming that such rates would be a satisfactory measure of erodibility since all material detached in a gully system usually is quickly transported away.

"Undisturbed soil cores taken in cylinders 9 inches in diameter by 4 inches deep were set up at State College near the new Agricultural Engineering building. Samples were taken from the surface from a hard sand clay stratum near the surface and from the low lying loose sand in the gully. Seventeen cores in all are set up for splash studies along with three cups of standard sand. The standard sand was washed thoroughly and was graded between 50 and 70 mesh of the U. S. Standard Sieve Series.

"The set-up of the cores on a level area about 150 feet east of our office in the Agricultural Engineering Building is shown below.



"Samples from each soil province are therefore exposed to the same rainfall and accordingly a comparison may be made of their relative splash susceptibility. Three to 6 months of natural rain will be used for the comparing period.

"Although no surveys were made immediately after some debris basins were constructed in the Pontotoc Ridge area in December 1949, a study was made to determine if sedimentation surveys could now be made for approximation of the sediment they now contain.

"Accurate plane table maps were made of three of these basins and an attempt was made to sound the sand to determine the depth of fill. Since we had a sand fill on an old sand bottom, there was some uncertainty in the fill depth determined by sounding. Calculations of these surveys are now under way and will be reported in October if it appears that reasonable accuracy attended the sedimentation survey."

IRRIGATION AND WATER CONSERVATION DIVISION

Wheat Yield - S. J. Mech, Prosser, Washington.-"Additional information on the character of the wheat yield has been obtained and is included in the table below:

Nominal	Number of irrigations	Yield		Ratio	Pounds per bushel	Number of heads per 36" of row	Computed weight in pounds per 1,000 heads
		Grain Bu./A.	Straw T/A	Grain/Straw			
Wet	4	65.2	3.24	0.60	60.3	81	1.67
Medium	2	67.4	3.22	.63	61.0	76	1.86
Dry	1	51.9	2.10	.74	61.2	95	1.15

"The differences in grain yield, straw yield, grain/straw ratio, and number of heads per 36 inches of row between the dry plots and either the wet or the medium ones are statistically highly significant. Those between the wet and the medium plots are not significant. The weight per bushel was highly significant for the comparison between the wet and dry; significant between the wet and medium, but not significant between the dry and medium.

"The larger number of heads on the wet plots and their lower weight is attributed to the stunting of vegetative growth in the irrigation furrow."

Irrigation Studies - P. E. Ross, Weslaco, Texas.-"Rains throughout the Lower Rio Grande Valley have been heavy during the month of September. In some areas excessively heavy falls have occurred, such as the 11 inches in Weslaco during the night of September 14, but generally the rains have been very beneficial in replenishing the soil with badly needed moisture.

"The rains were absorbed by fields that were in good condition but in some saline areas penetration was poor. On one farm on which irrigation water high in sodium had been used, H. V. Stephens, Soil Scientist, SCS Operations at Harlingen, Texas, found a penetration of 12 inches after 3-1/2 inches of rain. Under the same soil conditions where the water had not been used the rain had penetrated 32 inches. In other instances residue of red rop cane increased the penetration from 24 to 44 inches. Soils low in organic matter had a penetration of 15 inches compared with 48 inches and more on soils with a moderate amount of organic matter. These surveys by Stephens very definitely bring out some of the important advantages of good soil and water management practices.

"A survey of the water table on the F. J. Martin drainage project shows a rise in the table of approximately 2 feet from the near 9 inches of rain over a period of approximately 1 week. Before the rains there was no effluent from the tile but at the time the water-table measurements were made there was a flow of 15 gallons per minute. The effluent had 13,200 p. p. m. soluble salts.

"A survey of soil salinity on this project shows that excellent leaching was obtained in a saline area. The 5-acre area on which samples were taken previously was sampled 2 weeks after the heavy rains.

Soil Salinity Before and After Rains

	Depth	Before	After
	Inches	Percent	Percent
Sparse Cover	0-1	1.00	0.44
	1-2	.67	.44
	2-3	.68	.47
	3-4	.58	.69
Good Cover	0-1	0.17	0.04
	1-2	.19	.08
	2-3	.19	.19
	3-4	.23	.21
Good Cover	0-1	0.29	0.05
	1-2	.30	.16
	2-3	.24	.29
	3-4	.21	.35

"The above data are averages of six samples for each area reported. In one excessively saline area the leaching results were as follows:

Depth	Before	After
Inches	Percent	Percent
0-1	1.41	0.72
1-2	.90	.64
2-3	.72	.60
3-4	.72	.86

"This area is outside the area planted to clover in 1950 and it appears that another leaching will be required before crops can be successfully grown on it. The soil salinity determinations were made by H. V. Stephens, Soil Scientist, SCS, Harlingen, Tex.

"The outlying irrigation application efficiency study on H. J. Garrett's La Paloma farm has been completed for this season's cotton crop. The major objectives of this project were:

1. Measurement of infiltration rates, surface runoff, and deep percolation on near level runs.

2. To determine the total seasonal use of water by cotton on near level runs.

3. To measure the cost of water application on near level runs.

4. To determine the water-application efficiency on near level runs.

"The results of the data for the year are as follows:

1. Average rate of intake of irrigation water applied to the soil unit 4 was 0.87 inch per hour; there was no surface runoff and indications from soil-moisture sampling were that deep percolation losses were negligible.

2. The total water requirement for the plot was 27.97 inches; 15.97 inches of this amount was applied as irrigation water; and 12.0 inches fell as rainfall. The consumptive of the cotton crop was 14.21 inches of irrigation water and 6.30 inches of rain, or a total of 20.51 inches of water.

3. The labor cost of applying the water was 70¢/acre. The yield was 1.50 bales/acre.

4. The water-application efficiency for the season was 89.0 percent, i. e., 14.21 inches of the 14.97 inches applied was accounted for in the root zone of the crop.

"The soil on which the study was conducted is soil unit 4, deep, fine textured slowly permeable soil. The plot was 590 feet long and 42 feet wide. There was a total fall of 0.2 foot in the entire length of the run and the uniformity of the gradient was very good. All irrigation applications were applied to furrows. The listed furrows were deep and well defined for the pre-planting irrigation, the cultivated furrows were rather shallow and not well defined for the second irrigation, but were well plowed and cleaned for the third irrigation.

Summary of Data Compiled from Each Irrigation

Pre-planting Irrigation January 21, 1951
Head used 2.80 cfs or 90 gal/min/furrow
Total time of application 1 hour
Depth of application 4.91 inches

	0 + 100 Location 1	3 + 00 Location 2	5 + 00 Location 3	Over-all average
Inches Accounted for	4.71	4.11	6.35	5.07"
Efficiency	95.9	83.7	133.4	104.2%
Travel Time from Station 0 + 00	3.6'/min	12.6'/min	23.8'/min	21'/min
Average Velocity from Station 0 + 00	27.8'/min	23.8'/min	21.0'/min	
Infiltration Rate	1.06"/hr	.82"/hr	1.39"/hr	1.09"/hr

Irrigation of June 6, 1951
Head used 2.72 cfs or 87.9 p. m./Furrow
Total time of application 1 hour and 10 minutes
Depth of application 5.56 inches

	Location 1	Location 2	Location 3	Over-all average
Inches Accounted for	5.54	3.31	4.89	4.44"
Efficiency	99.6%	59.5%	88.0%	82.3%
Travel Time	3 min	15.0 min	34.5 min	
Average Velocity from Station 0 + 00	33.3'/min	20'/min	14.5'/min	14.5'/min
Infiltration Rate	1.08"hr	.69"/hr.	1.0"/hr	.92"/hr

Irrigation of June 28, 1951
Head used 2.15 cfs or 74.5 gal/Furrow/minute
Total time of application 1 hour 27 minutes
Depth of Application 5.50 inches

	Location 1	Location 2	Location 3	Over-all average
Inches Accounted for	4.45"	3.83"	4.99"	3.76
Efficiency	81.0%	69.6%	90.7%	80.6
Travel Time From Station 0 ⁄ 00	4.7 min.	14.9 min	31.9 min	
Average Velocity from Station 0 ⁄ —	21.2'/min	20.1'/min	15.7'/min	15.7
Infiltration Rate	.64"/hr	.52"/hr	.67"/hr	.62"/hr

Average of Data for all Irrigations at Each Location

	Location 1 Sta. 1 ⁄ 00	Location 2 Sta. 3 ⁄ 00	Location 3 Sta. 5 ⁄ 00	Over-all
Efficiency	92.2	70.9%	104.0%	89.0
Travel time from Sta. 0 ⁄ 00	3.8 min	14.1 min	30.0 min	
Average Velocity from Station 0 ⁄ 00 to	27.4'/min	21.3'/min	17.1/min	17.1/min
Infiltration rate	.93	.68	.88	.80

Rainfall and Irrigation Dates and Amounts

January 21	Irrigation	4.91	June 25	Rain	0.90
January 23	Rain	.20	June 26	"	.10
March 15	"	.45	June 26	Irrigation	5.50
March 24 & 25	"	1.30*	July 11	Rain	.10
March 26	"	.10	July 12	"	1.00*
April 9	"	.80*	July 13	"	.10
April 29	"	.50	August 1	"	.15
May 11	"	1.50*	August 2	"	.95
May 24	"	.30	August 18	"	.70
May 25	"	1.10*	August 22	"	1.00
June 3	"	.70			
June 6	Irrigation	5.56	* Effective Rain		

"From the results of the investigations on this irrigation system it appears that it is a well-designed and operated system. However, there are some interesting data which should be considered by designing technicians and by irrigators who operate the systems.

"It is noted that the intake of water at the mid-sampling point is consistently less throughout the year than it is at either of the sampling positions. This indicates a soil characteristic change in mid-field although it is not apparent from surface observations. This emphasizes the importance of thorough soil surveys before designing irrigation systems.

"Travel time of water data is also interesting. Note that only 23.8 minutes time was required for a head of 90 gallons per minute, per furrow to travel 500 feet during the preplanting irrigation, while 34.5 minutes was required for a head of 88 gallons per minute, per furrow to travel the same distance during the first irrigation after the crops had been cultivated. It should be pointed out too, that the cotton was 12 to 15 inches high at this time which permitted a large head of water to be used without covering the plants. Had it been necessary to reduce the head, the tr vel time no doubt would have been greatly increased. An examination of the efficiencies at the upper reaches and lower reaches of the run shows 99.6 percent and 88.0 percent respectively, which indicates that distribution of the waters would have been progressively worse with a reduction of head. Approximately 1 month later, however, after large cultivator sweeps had been used to throw a good roll of dirt to the cotton and clean out the furrows a head of 75 gallons per minute per furrow required only 32 minutes to travel 500 feet. This points up the importance of considering tillage practices when adjusting the head of water to the area being irrigated.

"Another factor which should be mentioned is the effect of wind on the irrigation. During the January 21 irrigation a wind of 23 to 25 miles per hour was blowing along the direction of flow of the water. Measurements of the surface level of the water in the furrows after the irrigation was completed showed it to be higher at the end of the run and, grading uniformily back toward the outlet. Evidently the wind caused this gradient, and accounted to an appreciable extent for the excess water in the soil at the lower reaches of the run. In this particular case, it is probable that a smaller head of water would have made for better distribution.

"Data from this year's work on efficiency studies indicate that systems being designed by Operations personnel in this area are excellent. The management of the systems after they are installed is very important and follow-up work with cooperators who do not recognize variable conditions appears to be essential for best efficiency."

Snow Surveys - C. E. Houston, Reno, Nevada.-"The 1951 forecast for irrigation season streamflow varied from drought conditions in central and southern Nevada to about 50 percent above normal in the north on the Main Humboldt. Snowmelt runoff from the Eastern Sierra Nevada was forecast from 25 to 50 percent of normal. Preliminary streamflow measurements by U. S. Geological Survey indicate the Humboldt forecasts were high and the Sierra were low. The drought in central and southern Nevada continues unabated. Climatological data at five representative stations in the Upper Humboldt Basin show that during the months of April, May, and June average temperature was about 3 degrees below normal. This undoubtedly, had a retarding affect on the melting of snow at higher elevations. In fact, snow is still stored in drifts at higher elevations and will probably remain there until next runoff season. As for our error in the Sierra forecasts, it appears that we gave insufficient weight to the 350 percent of normal precipitation which occurred during the storms of last November and December. We are continuing correlation studies to detect these discrepancies.

"During Mr. Clyde's trip in Nevada we inspected some Sierra Nevada snow courses and contacted snow surveyors and snow survey cooperators."

Irrigation Studies - C. E. H ouston, Reno, Nevada.-"During the last session of the Nevada Legislature an act was passed creating the Columbia River Basin Compact Commission of Nevada, with the State Engineer as chairman. The general purpose of this Commission is to represent Nevada in any dealings concerning the waters of Columbia River.

"The Columbia River Basin covers an area of approximately 259,000 square miles of which about 2,500, or less than 1 percent, is within the borders of Nevada. The major tributaries in this State are the South and East Forks of Owyhee, Bruneau, and Jarbidge Rivers, Salmon Falls Creek and Goose Creek. The elevation of the Nevada portion ranges from 5,000 to 10,000 feet with most of the irrigated areas in the 5,000-to 6,000-foot zone. Average annual precipitation ranges from about 5 to 25 inches with about 75 percent occurring in the form of snow. Informal estimates of Columbia Basin water leaving Nevada vary from one quarter to three quarters million acre-feet annually.

Mr. Shamberger, State Engineer, requested the assistance of the Soil Conservation Service in collecting preliminary data concerning (1) irrigated acreage in Nevada, (2) irrigable acreage and (3) amount of Columbia Basin water consumed in this State.

"The State Engineer's office has been quite active in the Salmon Falls Creek Watershed, and during the past 5 years the SCS has been actively cooperating with the two Soil Conservation Districts which cover the entire area.

"Last July Mr. Shamberger, Mr. Naphan, SCS Soil Scientist, and I spent a week in the Owyhee, Bruneau, and Jarbidge basins making a preliminary survey. Aerial photos, SCS survey maps, and the Northeastern Nevada Cooperative Land Use Study maps were used on the reconnaissance to delineate irrigated and irrigable lands. Crops, cropping practices, and irrigation methods were noted from observation and interview.

"In general, irrigation begins with the melting of snow about April 1. In areas where late water is not available, water application ends about July 1. Where late water is available there may be irrigation until the first of November. Over most of the irrigated section water is applied by diverting from a stream onto a field and allowing the water to flood the field for about 2 months when the stream either ceases to flow or must be removed so the field may dry out for haying.

"Preliminary figures developed by Mr. Naphan give the following acreages of agricultural crops and native vegetation for irrigated and irrigable areas:

Irrigated and Irrigable Acreage - Columbia River Basin in Nevada

Irrigated Acres		Irrigable Acres	
Alfalfa	860	Big Safe	146,320
Improved Hay and Pasture	14,980	Rabbit Brush	11,900
Native Hay and Pasture	49,230	Greasewood	5,120
Grain	1,660	Saltgrass Meadows	4,400
		Willows	4,890
		Low Sage	3,380
Total	66,730	Total	176,010

"Consumptive-use data will be developed for these acreages by use of information gathered on Salmon Falls Creek by the State Engineer, by the Blaney-Criddle formula and any other method which may be usable.

"All of these data will serve as a foundation upon which to build and revise as additional information becomes available from any source or may be developed expressly for this area. The idea, in general, is that when the time comes for the interested States to discuss the waters of the Columbia River and its tributaries,

Nevada will have authoritative basic information upon which to justify her claims for beneficial use of Nevada water in Nevada."

Sprinkler and Surface Irrigation Studies - W. D. Criddle, Boise, Idaho.- "Work was continued on the sprinkler and surface irrigation studies. An examination of the height of top growth and depth of root development in the clover on the sprinkler irrigation plot and the furrow irrigation plots at the Black Canyon Experimental Tract near Caldwell, Idaho, showed the two methods of irrigation gave similar results. On normal soils (silt loam 24 inches deep), the height of top growth was 36 inches above ground and the tap root had penetrated a depth of 19 inches below ground. On 'slick spot' soils the top growth was 15 inches above ground and tap root had penetrated 6 inches on the sprinkled plot and 7 inches on the furrow irrigated plot. In each case on the slick spot soils the feeder roots were spread out on the top of the clay layer which tends to stop irrigation water penetration. The clover crop was planted August 30, 1950.

"Average field intake rates on the downhill and contour plots are more nearly the same than either of the 2 preceding years. This may be partially due to the mechanical effect of the clover cover crop but there is some indication that the character of the soil is changing slightly because of cropping practices. The land was broken out of sagebrush 3 years ago."

Drainage Investigations - W. D. Criddle, Boise, Idaho.-"George B. Bradshaw is beginning work on the new Payette Valley Drainage Investigations. During September various information and maps of the area were assembled including soils, alkali, and topographic maps. A study to determine the necessary spacing of drains in a 400-acre muck or bog section of the valley was begun. An 8-foot deep open drain was constructed in 80 acres of the section and piezometers have been installed to determine the effect of the drain during an irrigation season."

Penetration of Rainfall and Irrigation Water - D. C. Muckel, Berkeley, California.-"Average annual amounts of deep penetration resulting from rains falling on the valley floor and from water artificially applied in irrigated and urban areas has been determined for the several basins of the Upper Santa Ann River Valley as shown in the following table. The total, 157,410 acre-feet, is sufficient to irrigate about 10,000 acres of citrus or 6,000 acres of alfalfa. Although individual years vary greatly from the average, the ground-water storage capacity is sufficiently large to carry over water from wet years or periods of years for use in dry periods. Therefore in an evaluation of deep penetration for Upper Santa Ana River Valley it is the average amount available over an unlimited time which is significant, rather than a shorter, possibly wetter or dryer period.

Basin	Deep penetration	
	From rainfall	From irrigation and urban areas
	Acre-feet	Acre-feet
Chino	60,100	26,400
Pomona	2,800	900
Claremont Hts.	2,000	600
Liveoak	1,000	500
Cucamonga	3,600	1,300
Bunker Hill	15,900	7,200
Devil Canyon	2,600	500
Cajon (lower)	3,200	80

Continued

Basin	Deep penetration	
	From rainfall	From irrigation and urban areas
	Acre-feet	Acre-feet
Lytle Creek	940	20
Rialto	3,900	800
Colton	1,900	700
Reche Canyon	640	30
Yucaipa	6,600	1,200
Beaumont	6,700	1,100
San Timoteo	2,200	2,000
Total	114,080	43,330

Replenishment of Underground Aquifers, San Joaquin Valley, California - H. F. Blaney and D. C. Muckel, Berkeley, California, and L. Schiff and E. S. Bliss, Bakersfield, California.-"A provisional 'Report on Cooperative Water Spreading Study with Emphasis on Laboratory Phases, Bakersfield, Calif., August 1948 - December 1950' by E. S. Bliss, C. E. Johnson, and L. Schiff was released to the cooperators. This report consists of 150 pages of text and figures and includes the subjects of field studies of relationships between soil properties and water movements; laboratory studies of soils and water percolation; and organic matter decomposition studies. It has been prepared primarily for the information of cooperating agencies and for in-Service-use and not for general distribution."

"A variable head infiltrometer regulated by float controlled valve fed by a calibrated supply tank was constructed for preliminary studies of the effect of head on infiltration rates under field conditions. This infiltrometer was placed within the inner pond of concentric pond set No. 2. The effect of leads up to 5 feet may be determined. Two additional variable head infiltrometers are being constructed.

"Studies are being conducted in size of area - subsurface flow-infiltration rate relationships.

"Studies of effects of cotton gin trash on percolation rates of soil packed in tubes were continued. The present group of tubes, which have undergone an incubation and a test run have been re-dried and the contents are being seived through the same 3.3 mm. seive used in originally preparing the soil. Tubes are then repacked in the identical manner in which they were originally, using the special tube packing machine developed for this purpose. This test will give a measure of the change in stability of the aggregates below 3.3 mm. dia. and the resulting pore space that can be ascribed to the particular treatments."

Permeability and Stability of Soil and Soil Materials - C. W. Lauritzen, Logan, Utah.-"The buried asphaltic membrane linings in sections 5 and 6A were removed. These linings consisted of a sprayed application of catalytically blown asphalt on a subgrade of pea gravel. The rate of application being 2 gsy, somewhat greater than normally recommended to determine the extent to which this increased application would offset the more severe condition imposed by the porous gravelly subgrade. The tests indicate that an application in access of 2 gsy. will be required to seal subgrades of this character. It appears that where buried asphaltic linings are to be used on gravelly subgrades, it will be advisable to dress up the subgrade with a topping of fine-textured material in preparation for the lining.

"An asphaltic membrane consisting of a prefabricated asphalt impregnated asbestos mat manufactured by the Johns-Manville Corporation was installed as the replacement lining in section 5A and an exposed lining of the same material installed in section 6A. These linings were installed on a subgrade of pea gravel similar to those they replaced, and covered with gravel. The material has the appearance of roofing, but is flexible and quite soft. The lining installed in 5A leaked more than expected when tested. The gravel cover was removed and an inspection of this lining showed that the membrane had been damaged by the gravel as results of working on the cover during the installation of the lining in 6A. While there were only three small punctures in this location, the surface was considerably marred over the entire lining by the gravel used for covering the lining. Section 6A was reasonably tight. The small amount of seepage measured apparently originated primarily along the joint. Our experience leads us to believe that one of the chief difficulties with prefabricated membranes will be the problem of obtaining water tight joints. Under the less favorable conditions associated with field installation, the problem is expected to be greater.

"The lining in section 5A, which was damaged, was replaced on a subgrade of sand-filled pea gravel and the cover modified to include a cushion course of concrete sand prior to adding the gravel topping. This replacement lining, while not fully water tight, compares favorably with the sprayed asphaltic membrane linings, or the unreinforced prefabricated linings. Johns-Manville has a field installation in California in which they employ this material, and we contemplate field installation on the Yellowstone Feeder Canal."

Silt Data, Texas Streams - D. W. Bloedgood, Austin, Texas.

Summary of Silt Data Texas Streams

Station	River	Length of record	Av. yearly discharge A. F.	Av. silt load A. F.	Total silt load A. F.
Belton	Leon	4.3	339,500	353	1,530
Easterly	Navisota	8.7	337,600	203	1,780
South Bend	Brazos	8.7	509,100	2,669	23,245
Richmond	"	26.3	5,698,000	22,756	598,611
Llano	Llano	8.2	191,960	216	1,763
Johnson City	Pedernales	8.2	93,966	122	997
San Saba	Colorado	20.0	1,155,400	2,996	60,082
Spring Ranch	Guadalupe	8.7	185,900	94	819
Victoria	"	5.1	1,003,900	381	1,939
Edna	Lavaca	5.1	163,000	122	619
Horger	Angelina	5.1	2,743,100	415	2,110
Rockland	Neches	20.1	2,057,100	308	6,200
Cotula	Nueces	8.7	185,100	74	651
Three Rivers	"	23.0	673,900	498	11,457
Logansport	Sabine	16.1	3,028,400	728	11,769
Goliad	San Antonio	8.7	471,700	453	3,964
Huffman	San Jacinto	5.1	1,784,400	648	3,295
Humble	" "	14.3	821,700	254	3,639
Romayor	Trinity	14.1	6,664,800	4,342	66,405
Lake Possum Kingdom	Brazos	8.7	524,200	76	665
Note: During same period (8.7 years) 22,580 A. F. silt was deposited in Lake.					
Lake Corpus Christi	Nueces	8.7	642,718	142	1,234

Silt Studies - D. M. Bloodgood, Austin, Texas.-"Progress Report No. 12 of the Silt Load of Texas Streams (1949-1950) was multilithed during the month."

12/5/51